

### FEATURES

Accepts Potentiometers up to 10,000  $\Omega$   
 High Level 0 V to +5 V Output  
 1500 V rms Input/Output and Input/Power Isolation  
 250 V rms Output/Power Isolation  
 240 V rms Field Wiring Protection  
 170 dB CMRR  
 116 dB NMR @ 60 Hz, 108 dB @ 50 Hz  
 Low Gain Drift:  $\pm 30$  ppm/ $^{\circ}\text{C}$   
 Low Output Noise:  
     0.3 mV p-p @ 100 kHz BW  
     6 mV p-p @ 5 MHz BW  
 Low Power Consumption: +5 V dc @ 15 mA  
 ANSI/IEEE C37.90.1-1989 Transient Protection  
 CSA, FM and CE Approvals

### GENERAL DESCRIPTION

Model 5B36 converts the input from a variety of potentiometers and variable resistors to a high level output of 0 V to +5 V. The module provides transformer isolation, potentiometer excitation, signal filtering and input protection against line voltage connection. The series output switch eliminates the need for external multiplexing. The industry standard 5B Series encapsulated plug-in modular package is compatible with all 5B backplanes. Modules are powered by +5 V dc,  $\pm 5\%$ .

Signal isolation is provided by transformer coupling using a proprietary technique for linear, stable performance. A demodulator on the output side of the signal transformer recovers the input signal, which is filtered and buffered to provide an accurate, low impedance, low noise output.

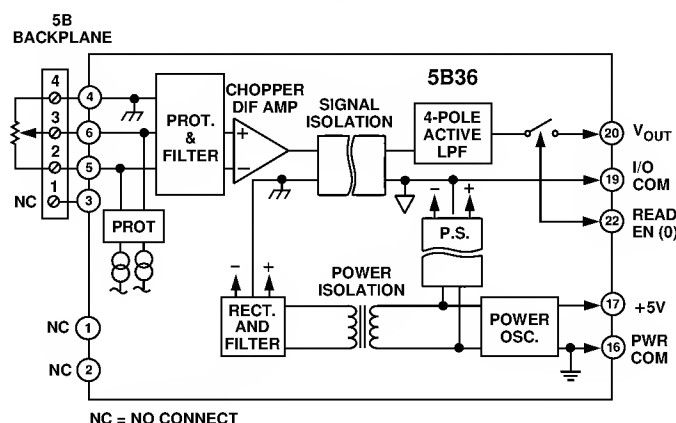
True three-port isolation includes common-mode voltage of: 1500 V rms between input and output, and between input and power; 250 V rms between output and power.

The modules provide potentiometer excitation from a precision current source. A low drift, chopper stabilized, differential amplifier design allows for the use of very low excitation currents to minimize accuracy losses from self-heating of the potentiometer. The low gain drift of  $\pm 30$  ppm/ $^{\circ}\text{C}$  and low offset drift assure that accuracy is maintained over a wide operating temperature range.

The 5B36 supplies equal excitation currents to three-wire potentiometers to cancel the effects of lead resistance.

An optimized five-pole Butterworth filter (with 4 Hz bandwidth) provides 116 dB of normal-mode rejection at 60 Hz and 108 dB

### FUNCTIONAL BLOCK DIAGRAM



at 50 Hz. Output noise is an exceptionally low 0.3 mV p-p at 100 kHz bandwidth and 6 mV p-p at 5 MHz bandwidth.

The input circuit is protected against accidental application of voltages, such as an ac power line, up to 240 V rms continuous.

A series output switch is included to eliminate the need for external multiplexing in many applications. This switch has a low output resistance and is controlled by an active-low enable input. When the output switch is not used, ground the enable input to I/O common to turn on the switch.

### REV. 0

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# MODEL 5B36—SPECIFICATIONS (typical @ +25°C and $V_S = +5$ V dc)

Model	5B36
INPUT	
Standard Ranges	See Table I
Custom Range Limits	See Table II
Impedance	
Normal (Power On)	>1000 M $\Omega$
Power Off	200 k $\Omega$
Overload	200 k $\Omega$
Normal Mode Rejection (NMR)	116 dB (60 Hz); 108 dB (50 Hz)
Protection	
Continuous	240 V rms max
Transient	ANSI/IEEE C37.90.1–1989
SENSOR EXCITATION CURRENT	
100 $\Omega$ , 500 $\Omega$ , 1 k $\Omega$ Sensors	0.25 mA
10 k $\Omega$ Sensor	0.1 mA
LEAD RESISTANCE EFFECT	
100 $\Omega$ , 500 $\Omega$ , 1 k $\Omega$ Sensors	$\pm 0.005$ $\Omega/\Omega$
10 k $\Omega$ Sensor	$\pm 0.01$ $\Omega/\Omega$
COMMON-MODE VOLTAGE (CMV)	
Input-to-Output, Continuous	1500 V rms, max
Input-to-Power, Continuous	1500 V rms, max
Power-to-Output, Continuous <sup>1</sup>	250 V rms, max
COMMON-MODE REJECTION (CMR) 50 Hz/60 Hz	170 dB
ACCURACY	
Initial @ +25°C <sup>2</sup>	$\pm 0.08$ % Span
Stability vs. Temperature (–40°C to +85°C)	
Input Offset	
100 $\Omega$ , 500 $\Omega$ , 1 k $\Omega$ Sensors	$\pm 0.004$ $\Omega/^\circ\text{C}$
10 k $\Omega$ Sensor	$\pm 0.010$ $\Omega/^\circ\text{C}$
Output Offset	$\pm 20$ $\mu\text{V}/^\circ\text{C}$
Gain	$\pm 30$ ppm of Reading/ $^\circ\text{C}$
OUTPUT	
Range	0 V to +5 V
Resistance	25 $\Omega$
Bandwidth, –3 dB	4 Hz
Step Response Time (10% to 90% Range)	100 ms
Noise	
Input, 0.1 Hz to 10 Hz	0.2 $\mu\text{V}$ rms RTI <sup>3</sup>
Output, 100 kHz Bandwidth	100 $\mu\text{V}$ rms
	0.3 mV p-p
Output, 1 MHz Bandwidth	1.5 mV p-p
Output, 5 MHz Bandwidth	6 mV p-p
Protection	Continuous Short to Ground
Current Limit	$\pm 9$ mA
Enable Time (C Load = 0 pF to 2000 pF)	6 $\mu\text{s}$ to $\pm 1$ mV of $V_{\text{OUT}}$
Enable Control	
Max Logic “0”	+0.8 V
Min Logic “1”	+2.4 V
Max Logic “1”	+100 V
Input Current “0,” “1”	0.5 $\mu\text{A}$
POWER SUPPLY	
Voltage, Rated Performance	+5 V dc $\pm 5$ %
Current	15 mA
Sensitivity	$\pm 2$ $\mu\text{V}/\%$ RTI <sup>3</sup>
CASE SIZE, Maximum	2.275" $\times$ 2.325" $\times$ 0.595" (57.8 mm $\times$ 59.1 mm $\times$ 15.1 mm)
WEIGHT	70 grams
ENVIRONMENTAL	
Temperature Range, Rated Performance	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0% to 93% @ +40°C, Noncondensing
RFI Susceptibility	$\pm 0.5$ % Span Error @ 400 MHz, 5 W, 3'

## NOTES

<sup>1</sup>The user's board layout must separate Power Ground from I/O Common and when the 5B36 output switch is not used, ground the enable input to I/O Common. Power-to-Output CMV is not available when the 5B36 is installed on a 5B Series backplane.

<sup>2</sup>Includes the combined effects of repeatability, hysteresis and nonlinearity.

<sup>3</sup>Referenced to input.

Specifications subject to change without notice.

**Table I. Standard Model Input/Output Ranges\***

Model	Input Range	Output Range
5B36-01	0 $\Omega$ to 100 $\Omega$	0 V to +5 V
5B36-02	0 $\Omega$ to 500 $\Omega$	0 V to +5 V
5B36-03	0 $\Omega$ to 1 k $\Omega$	0 V to +5 V
5B36-04	0 $\Omega$ to 10 k $\Omega$	0 V to +5 V

## NOTE

\*Custom input/output ranges are available. See Table II.

**Table II. Custom Model Ordering Guide**

Order Model: **5B36-CUSTOM**

Plus Customer Specified Information

Input Range

**Zero Suppression**

(= Low); *specify*

Minimum 0  $\Omega$

Maximum 150  $\Omega$

**High; specify**

Minimum 25  $\Omega$  + Zero Suppression

Maximum 10 k $\Omega$  + Zero Suppression

Output Range

Low; *fixed* 0 V

**High; specify** +5 V max

Examples:

Smallest Input Range with No Zero Suppression

Specify 0  $\Omega$  to 25  $\Omega$  Input Range

Smallest Input Range with Highest Zero Suppression

Specify 150  $\Omega$  to 175  $\Omega$  Input Range

Largest Input Range with No Zero Suppression

Specify 0  $\Omega$  to 10 k $\Omega$  Input Range

Largest Input Range with Highest Zero Suppression

Specify 150  $\Omega$  to 10.150 k $\Omega$  Input Range